Economic Analysis of Corporate Tax Reform Policy Options – Tradeoffs Affecting Revenue and Growth Assumptions

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Executive Summary

- This report examines the implicit trade-offs relating to the budgetary and economic effects of several key provisions in the House Republican Blueprint for tax reform. These provisions relate to the corporate tax rate, expensing of new investment, limitations on interest deductibility and the border adjustment tax (BAT).

- The Blueprint is a wide-ranging and comprehensive effort to move the current U.S. tax system towards a destination-based cash flow tax. The reforms make significant changes to both the individual and corporate income tax. Our focus in this report is on the corporate reforms and we consider marginal changes to the legislation while maintaining revenue neutrality versus the Blueprint, as proposed.

- Specifically, we examine how the 20 percent corporate tax rate proposed in the Blueprint might change if full expensing were eliminated or if the 50 percent bonus depreciation was made permanent, the BAT eliminated and interest remained deductible. In preparing these estimates we have relied primarily on Quantria Strategies' simulation models of depreciation and corporate taxes as well as recent, published estimates of dynamic macroeconomic feedback effects released by the Joint Committee on Taxation (JCT).

- We also calculated the amount of spending reductions that would be necessary to maintain a 20 percent corporate tax rate or revenue increases that would result at a 20 percent corporate tax rate in the various different scenarios.

- Our main conclusions are summarized in the following table (each scenario was solved to achieve the same revenue as the House Republican Blueprint):

Depreciation	Is Interest Deductible?	Allow Corporate Rate to Adjust Without Border Adjustment Tax	Maintain Corporate Rate at 20% Without Border Adjustment Tax: Additional Spending Reductions Needed†
MACRS	Yes	17.2%	-$278.2
MACRS	No	14.8%	-$602.3
50% Bonus and MACRS	Yes	19.5%	-$46.2
50% Bonus and MACRS	No	16.5%	-$370.3
Full expensing	Yes	¥	$1,598.8
Full expensing	No	¥	$1,274.7
Source: Quantria Strategies, May 12th, 2017			
† *A negative number indicates the proposal raises revenue relative to the Blueprint.*			
¥ Revenue *target cannot be attained without a tax rate above 35 percent.*			

- Our work illustrates that full and immediate expensing is very expensive, even when viewed dynamically. While much attention has centered on the positive revenue impact of the BAT in supporting a rate reduction, it has largely ignored the much larger negative impact on the rate by having to use the BAT and other revenue raisers to pay for full and immediate expensing.

- While a lower corporate tax rate and immediate expensing will each spur economic growth by lowering the cost of capital, our analysis shows that lowering the corporate tax rate is a more effective policy instrument and provides more economic stimulus, or what is sometimes called dynamic feedback.

- We estimate that the 20 percent corporate rate contained in the Blueprint could be lowered substantially if expensing was curtailed or eliminated, with or without the BAT.

- Another interesting result of our analysis of these trade-offs is that revising the Blueprint to (i) leave depreciation as it is today (ii) make the 50 percent bonus depreciation permanent (iii) retain interest deductibility (iv) remove the BAT and (v) keep the 20 percent corporate tax rate, would produce virtually the same ten-year revenue as originally proposed in the Blueprint, as shown in the following table:

Parameter	Ten-Year Revenue Impact *(in trillions)*
No immediate expensing	$1.9
No border Adjustment	-$1.3
50% Bonus made permanent	-$0.2
Interest deductibility retained	-$0.3
Total	**$0.1**

- Our estimates include positive, dynamic, macroeconomic feedback effects for reductions in the corporate tax rate and expensing. That said, JCT evidence suggests that, depending on the policy being considered, macro feedback effects are likely to be modest especially when the comprehensive tax reform is being considered and revenue neutrality is maintained. We do not include any dynamic effects for the BAT, either positive or negative, due to a large range of uncertainty surrounding how the U.S. macro economy might respond to this change.

- According to its authors, the Blueprint was designed to be revenue neutral, meaning that over the 10-year budget horizon used by congressional scorekeepers, the reforms would collect approximately the same amount of revenue as our current income tax system. In this analysis, we assume, like the authors of the Blueprint, that the Blueprint is revenue neutral. Recent independent analyses have concluded that the reforms would increase the federal deficit in the long run, which could reduce economic growth.

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I. Background

The Republican Blueprint for individual and corporate tax reform (A Better Way) recommends significant changes in the way businesses are taxed that are far-reaching, complex and, at least at this point, with significant details left to be decided. Nevertheless, it is clear that business and industry groups need to pay close attention as tax reform legislation moves through Congress.

In this analysis, we present a strategy and schedule for examining the economic tradeoffs – revenue changes, industry impacts and dynamic (i.e., macroeconomic feedback) analysis – of modifications to four central features of the Blueprint. Specifically, our analysis will examine incremental changes to the expensing provisions, the border adjustment tax, interest deductibility, and the corporate tax rate and how these changes interact with the requirement that the proposals remain revenue neutral. A second objective of this study is to calculate additional spending cuts that are consistent with retaining the proposed 20 percent corporate tax rate.

The Blueprint provides for a reduction in the maximum corporate tax rate from 35 to 20 percent, as well as many other significant provisions affecting corporate tax revenues. Our analysis will assume that all of the provisions in the Blueprint are in place and we will focus only on the interaction of the expensing, interest deductibility, and border tax adjustment changes and how the corporate tax rate would adjust to ensure revenues remain the same. Put somewhat differently, we will assume that expensing, the border tax adjustment, interest deductibility, and the corporate tax rate are "stacked last" and our analysis will examine how revenues will change under the Blueprint if these provisions are modified.

An important goal of this analysis is to ensure that any reductions in revenues from the proposal we outline are "paid for" so that the marginal effect on the Blueprint remains revenue-neutral. This is important because a reduction in the corporate tax rate will, by itself, result in a reduction in the cost-of-capital that firms will face. Collectively, these changes will provide additional incentives for companies to increase capital expenditures that will, in turn, affect the revenue and dynamic effects of the tax change. At a high level, curtailing the benefits of immediate expensing reduces the incentives to increase capital expenditures though the impact is relatively small at a 20 percent tax rate.

II.   Proposed Changes

For corporations, the proposals contained in the Blueprint are designed to move towards a consumption-based, or cash-flow tax. Highlights of the tax plan include:

- A flat, corporate tax rate of 20 percent;
- Repeal of the corporate Alternative Minimum Tax (AMT);
- Allow immediate expensing of investment in tangible (e.g., equipment and structures) and intangible (e.g., patents and intellectual property);
- Limit the deduction for interest expense to offset interest income only. Unused deductions can be carried forward indefinitely subject to additional limitations;
- Allow net operating losses (NOL) to be carried forward indefinitely (but not backward, as under present law. The amount of the NOL carried forward is indexed for inflation and allows for a real return on capital;
- Eliminate yet unspecified "special-interest" deductions and credits. However, the credit for research and development is likely to be maintained in some form;
- Move towards a destination-based, or territorial tax system for multinational corporations;[1]
- Implement a border adjustment tax with the goal of exempting exports and taxing imports (details of this plan are still being developed); and
- Allow a one-time repatriation for corporations with income residing overseas (tax rate of 8.75 percent for cash or cash-equivalent assets and for non-cash assets, the rate is 3.5 percent and may be paid over 8 years).

Many provisions in the plan need additional details to create a workable system. The lack of specificity allows our analysis to specify certain policy assumptions that inform the policy approach.

One of the goals of this analysis is to maintain a balance that ensures the changes do not materially alter the revenue and distributional neutrality. In order to maintain revenue neutrality, as outlined in the Blueprint, we will consider moving from full expensing to modifications that accelerate the timing of depreciation (compared to present law), but are not as aggressive as full expensing.

The following sections detail the analysis of the provisions contained in the Blueprint proposal as well as our revenue analysis that accompany each proposal and options associated with each.

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[1] Unlike current law, where corporations are taxed on their worldwide income where production occurs, the new system will tax companies where the goods are sold.

III. Analysis of Immediate Expensing – Static

In this section, we analyze the economic and revenue implications of expensing contained in the House Republican tax reform plan (A Better Way).

One question regarding the economic benefits of allowing immediate expensing is the degree to which it will increase investment. Some believe that the economic stimulus will be significant. However, many believe that, coupled with a considerable decrease in the corporate tax rate, the benefits of expensing are overstated. We evaluate these arguments and provide our estimate of the revenue effect of the expensing and various options associated with accelerating the timing of depreciation deductions.

A. JCT Revenue Analysis for Cost Recovery

Revenue estimates quantify the effects of proposed changes in tax policy. Thus, when Congress considers a change in the law affecting Federal receipts, the staff of the Joint Committee on Taxation prepares a revenue estimate. These revenue estimates rely on a predetermined set of budget scoring rules, established in the Congressional Budget and Impoundment Control Act of 1974 (the Budget Act) which introduced discipline to the annual Federal budget process.[2]

Since that time, in conjunction with increasing budget deficits, a number of legislative changes made it more difficult for Congress to enact revenue losing measures. Members of Congress who wanted to offer a specific tax provision that reduced tax revenues were generally required to find a compensating proposal to increase revenues.[3]

It is important to recognize that existing revenue estimating conventions for cost recovery can have long-term budget consequences to the Federal government. Given the predetermined framework of the fixed budget baseline, the 10-year budget window, and cash-flow accounting, revenue estimates of many proposals – including accelerated cost recovery – display losses within the budget window.

1. Key Concepts of Revenue Analyses

Revenue Baseline – The starting point for many revenue estimates is the revenue baseline, which is the benchmark against which proposed changes in the law are measured.[4] This is a 10-

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[2] Public Law 93-344. Other factors have influenced the present-day scoring rules, including the Balanced Budget and Emergency Deficit Control Act of 1985 (Gramm-Rudman-Hollings) which established maximum deficit amounts and provided that, if the deficit exceeded the statutory limits, the president would be required to issue a sequestration order under which discretionary spending would be reduced by a uniform percentage.

[3] Thus, the specific size of a revenue losing provision became a much more important consideration in the legislative process.

[4] There are two revenue baselines – one prepared by the CBO and one prepared by the Office of Management and Budget (OMB) in connection with the annual budget submitted to the Congress by the president. There are two ways in which the revenue baselines of these two organizations may differ. First, the revenue baselines may differ depending upon the macroeconomic forecasts used by each office. Second, the revenue baselines will invariably differ because the OMB includes in its revenue baseline an assumption that the president's budget proposals are all enacted into law. The CBO baseline does not include such an assumption.

year projection of Federal revenues under present law; thus, the revenue baseline generally is constructed assuming no changes in current policies. The revenue baseline represents the best estimate of the receipts and outlay activities by the Federal government based on current macroeconomic forecasts, such as interest rates, growth in the economy, and changes in employment levels.

Budget Window – Revenue estimates are generally required to be provided as point estimates, specifying a dollar amount, rather than a range of possibilities for each year in the "budget window." Revenue estimates rely on a fixed ten-year budget period. This means that only those changes that occur within this window will contribute to the revenue estimate.[5]

While many revenue proposals are effective on a taxable year or calendar year basis, the JCT prepares revenue estimates for each year within the budget window as fiscal year estimates (for the period from October 1 to September 30, which is the Federal government's fiscal year).[6]

Cash Method of Accounting – In general, the estimates of revenues and outlays for purposes of the Federal budget are measured on a cash basis – thus, the budget measures the cash flows that occur with the collection of taxes and other forms of Federal income during each fiscal year during the budget scorekeeping window and the disbursement of funds for various Federal programs.[7] The theory is that using a single method of accounting for revenues and outlays will allow the comparison of spending and revenue proposals on a comparable basis.[8]

However, cash-flow revenue estimates of accelerated methods of depreciation (as well as many other tax provisions) show significant revenue losses in early years that are offset by revenue increases (associated with the reduced amounts available for cost recovery) beyond the budget period.

The revenue baseline captures the current-law depreciation deductions claimed over the 10-year budget period. The revenue analysis calculates the proposed changes to allow immediate expensing for capital investment. The difference between the baseline and the proposed change provides the revenue estimates displayed on JCT revenue tables.

Estimate of Expensing – Equipment and Structures – When the JCT considers moving to a system that allows expensing of capital acquisitions, it requires two estimates. The first estimate

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[5] Historically, revenue estimates were prepared for a five-year period, but the period was extended to 10 years in the late 1980s.

[6] In addition, revenue estimates are required to be expressed in nominal dollars.

[7] For example, such entitlement programs as Social Security, defense spending, transportation programs, etc., for the same period.

[8] Although Federal revenues and outlays generally are calculated on a cash basis, there are two notable exceptions to this cash-basis accounting for outlay purposes. The Federal Credit Reform Act requires that the budget recognize the present value of expected cash flows from new direct loans and loan guarantees at the time the loans are disbursed, rather than over the life of the loans. In addition, interest on Federal debt is included in the Federal budget as an outlay when the debt is incurred, rather than when the interest is paid. Refer to *Comparing Budget and Accounting Measures of the Federal Government's Fiscal Condition,* Congressional Budget Office, December, 2006.

establishes the current level of depreciation claimed on all business tax returns. The second estimate calculates the acceleration of the depreciation over the current level.

Table 1 shows the recovery rates for assets with three-, ten-, and fifteen-year recovery periods under current law as well as under expensing. The current law rates assume the taxpayer uses double-declining balance with a half-year convention (MACRS). The second column assumes that the full acquisition cost would be taken as a deduction in the first year. The final column shows the timing difference in the two cost recovery patterns.

It is important to understand that this table demonstrates the difference between the timing of the deductions. In each recovery period, the rates of recovery sum to 100 percent. It is only the timing or the acceleration of the recovery that changes.

With respect to recognizing the revenue analysis, these patterns apply each year when a business owner places in service the asset (with the appropriate recovery rates). Therefore, each year's investment will reflect the composition of those assets and the pattern begins anew, each year in the budget window.

Table 1 – Difference in Recovery Rates, MACRS Compared to Expensing			
Year	MACRS Recovery Rate	Expensing	Difference in Recovery Pattern
Three-Year Recovery Period			
1	33.33%	100%	-66.67%
2	44.45	–	44.45
3	14.81	–	14.81
4	7.41	–	7.41
Ten-Year Recovery Period			
1	7.50%	100%	-92.50%
2	18.50	–	18.50
3	14.80	–	14.80
4	11.84	–	11.84
5	9.47	–	9.47
6	7.58	–	7.58
7	6.55	–	6.55
8	6.55	–	6.55
9	6.56	–	6.56
10	6.55	–	6.55
11	4.10	–	4.10
Fifteen-Year Recovery Period			
1	3.75%	100%	-96.25%
2	9.63	–	9.63
3	8.66	–	8.66
4	7.80	–	7.80
5	7.02	–	7.02
6	6.31	–	6.31

Table 1 – Difference in Recovery Rates, MACRS Compared to Expensing			
Year	MACRS Recovery Rate	Expensing	Difference in Recovery Pattern
7	5.90	–	5.90
8	5.90	–	5.90
9	5.91	–	5.91
10	5.90	–	5.90
11	5.91	–	5.91
12	5.90	–	5.90
13	5.90	–	5.90
14	5.90	–	5.90
15	5.90	–	5.90
16	5.90	–	5.90

With respect to the depreciation deduction, expensing accelerates the timing of the expenses. For assets with a short recovery period, this does not alter materially the revenue pattern over the budget window. However, as the recovery period increases, the depreciation deductions move into the budget window (as MACRS would have required they spread them over the useful life).

This raises two important points. First, the revenue analysis of expensing results in a larger revenue loss in the budget window, but does not reflect all of the offsetting loss of deductions, because the budget window is limited to the ten-year period. These offsetting losses of deduction (timing changes) will mitigate the revenue losses over time.[9] The other important point is that because businesses continue to invest in new equipment and structures, the positive (loss of deductions) tend to get overshadowed by the acceleration of the deductions under expensing.

B.   MACRS Baseline

Taxpayers recover, through annual depreciation deductions, the cost of certain assets acquired for the production of income. Under current law, the schedule for determining the annual depreciation deductions follows the modified accelerated cost recovery system (MACRS). MACRS assigns to different assets, a recovery period (years over which the taxpayer claims the deductions) and the depreciation method (timing of the annual depreciation deductions over the recovery period).

The recovery periods that apply to most assets range from three to 25 years. The depreciation methods that apply to these assets are generally declining balance method (200- and 150-percent) with a switch to the straight-line method. In general, the recovery periods applicable to real

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[9] From a scoring perspective, each year's vintage of investment and revenue loss associated with expensing would be offset by the loss of deductions in future periods. However, even extending indefinitely the budget window would not cancel the revenue loss associated with the timing change in depreciation deductions. As new investment occurs in future years, the new accelerated deductions would overshadow the future period offsetting loss of deductions.

property are 39 years for non-residential real property and 27.5 years for residential rental property. The depreciation method for real property is the straight-line method.

The MACRS does not require the taxpayer to estimate salvage value, but rather allows the taxpayer to recover the full investment basis. In addition, the recovery period for tax purposes is often not reflective of the actual economic life of the asset. However, overall, MACRS recovery periods correlate positively with the actual economic life.

As the following graph indicates, the vast majority of depreciation claimed was attributable to the MACRS system. In 2013, the IRS reports that taxpayers claimed $621 billion in depreciation deductions.

Graph 1 - Total Deductions Claimed, by type of Depreciation
Source: IRS, SOI 2013 Corporate Returns Data, February 2016
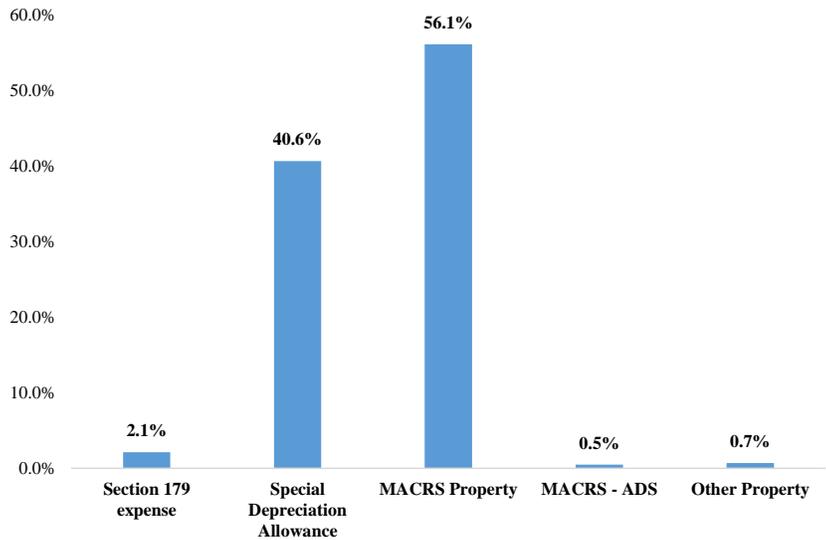
In addition, approximately 85 percent of the MACRS depreciation deductions represent cost recovery for asset placed in service prior to the current tax year.[10] It is important to note that cost recovery for such assets as structures with longer services lives are subject to the straight-line method of depreciation. The straight-line method provides annual deductions that are approximately equal each year.[11] This level of depreciation claimed indicates a significant annual investment (for nonresidential assets). According to the

Graph 2 - Investment and Depreciation, Distributed by MACRS Class, Tax Year 2013
Source: IRS, SOI 2013 Corporate Returns Data, February 2016

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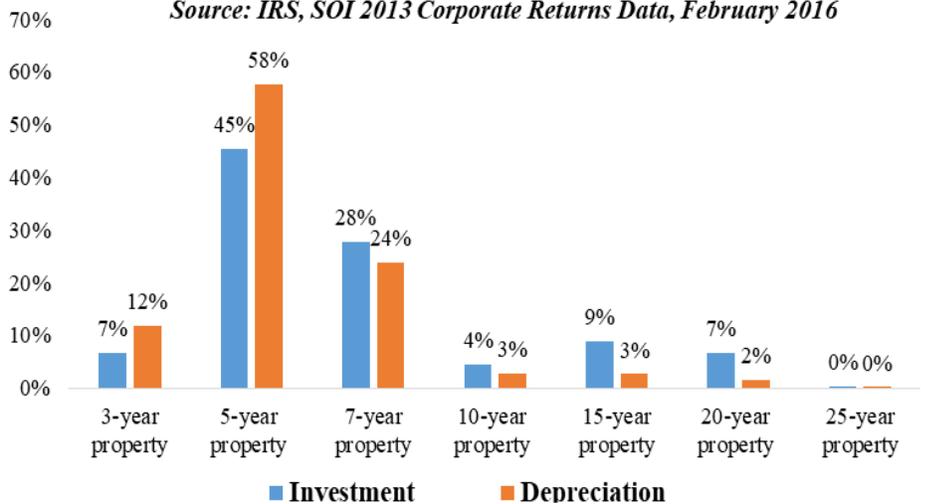
[10] Refer to the IRS, SOI, 2013 Corporate Returns Data, February 2016.
[11] Depending upon the asset considered, the first-year depreciation may require a mid-month or mid-quarter convention for purposes of prorating the first year's depreciation. Therefore, the first and last year of annual deductions may vary.

Bureau of Economic Analysis (BEA) of the Department of Commerce, annual investment was $1.7 trillion in 2015. Of this current investment, approximately 70 percent is attributable to investment in equipment.

Graph 2 presents the current investment distributed by the MACRS asset classes. As shown in this graph, the vast majority of investment (73 percent) has 5- or 7-year recovery periods. Further, the vast majority of depreciation claimed under MACRS (82 percent) is attributable to the assets in the 5- or 7-year recover periods.

C.   Estimating Expensing for Equipment and Structures

This timing difference suggests that, within any budget scoring period, a move to accelerate cost recovery will result in a revenue loss due to higher deductions (compared to the baseline) moving into the budget scoring period.

The basic steps for estimating the (prospective) total recovery differential include:

- Characterizing the baseline cost recovery by asset classes to create weights for investment by asset (consistent with the IRS data release);
- Creating vintages within each class (to estimate the year of acquisition and the remaining cost recovery);
- Mapping BEA investment flows into service life classes (distribute investment flows with IRS weights);
- Forecasting investment over the budget period using CBO baseline assumptions;
- Creating separate recovery patterns for future investment; and
- Calibrating investment for C corporations and pass-through entities and sole proprietors;

After estimating the differential in cost recovery over the budget period, the revenue loss is the corporate rate (or weighted rate to reflect other entity types) times the net deduction. The estimate will not affect the ability of the business entity to claim fully the deduction, as the interaction line of the estimate contains this effect.

The preliminary estimates assume that the 20 percent corporation tax rate is applicable. In estimating terms, this means that the expensing provisions are 'stacked last,' after the rate change is in effect.

The following estimates assume full expensing (100 percent); 80 percent expensing with straight-line depreciation in subsequent years; and 70 percent expensing with straight-line depreciation in subsequent years. In addition, we include an additional option which restores and extends the current-law bonus depreciation for certain assets.

Table 2 provides the estimated revenue loss of allowing expensing, at various tax rates (depending upon the assumptions about the effective tax rate or a weighted statutory rate). All dollar amounts are in billions. The estimate adjusts for the following:

- Adjusts the cost estimate for assets currently using section 179 expensing provisions; these assets continue to receive expensing, but the cost of this provision is part of the scoring baseline;
- Allocates a portion of the current law depreciation to the ADS (based on historical practices); and
- Assumes investment growth that is consistent with the economic baseline growth in GDP (this was the growth rate trend that most closely matched the historical growth in investment).

Table 2 – Preliminary Estimated Revenue Loss from Expensing for All Businesses, at Various Levels of Expensing, Evaluated at 20 percent Corporate Income Tax Rate* *Dollar Amounts in Billions*	
Percent of Capital Immediately Expensed	**2018-2027**
100%	-2,321
80%	-2,041
70%	-1,636
Extend Bonus (50%)	-293
* Expensing for pass-through entities (e.g., partnerships, sole proprietorships and S-corporations are evaluated at the maximum tax rate of 25 percent as outlined in the Blueprint.	

D.   Conclusions and Caveats

Expensing (and various options for expensing) would accelerate the timing of the depreciation deductions currently allowed under present-law MACRS. Generally, this provides a small benefit to businesses, if they have adequate income to absorb the increase in total allowable deductions.

However, there are two important caveats to this simplistic view of expensing. First, the benefits of expensing are lessened in the presence of such other corporate tax reform provisions as significant reductions in the corporate tax rate. Cost of capital analysis demonstrates that, in most cases, the benefits of the rate reduction exceed the benefits from the change in the timing of the depreciation deductions.

Reductions in the corporate rate would apply more broadly to the operations of the business and lowers the overall tax burden. Expensing, on the other hand, simply allows the business to take the deductions sooner, but does not increase the total amount of the deductions. While many may appreciate the acceleration of deductions, it is a transitory benefit.

Second, and potentially more importantly, the current budget scoring rules require a cash flow analysis of changes to the tax provisions. As discussed previously, the timing differences make expensing appear more costly inside the ten-year budget window. Many policymakers have great concerns about the budget deficit and associated revenue losses that contribute to that deficit. Therefore, it is important to evaluate the benefits of expensing in light of such other reform priorities as significant reductions in the corporate rate.

IV. Analysis of the Border Adjustment Tax

One important, controversial and disputed effect of the border adjustment tax is how exchange rates may (or may not) adjust to the new regime. Some economists believe that the U.S. dollar will appreciate proportionately, vis-à-vis other currencies, and domestic firms will not incur any additional costs. We evaluate these arguments but point out that, for the purpose of the revenue estimate contained here – before any dynamic, macroeconomic effects are considered – the official government estimates are likely to ignore any exchange rate adjustment. This is because, by historical convention, government economists are required to assume that Gross Domestic Product (GDP) remains unchanged and no exchange rate adjustment would occur.

Border adjustments have usually been associated with value added taxes (VATs). Under a VAT, cumulative taxes collected at each stage in the production process (the "value added") are rebated when products are exported.

The border adjustment tax contained in the House Republican Blueprint has the same effect but is arguably easier to implement. The rationale behind the BAT is to shift business taxation to where consumption occurs rather than where production occurs, as is the case under our existing business income tax system. The mechanism for achieving this result is to exempt exports from tax while taxing imports. Coupled with the business cash flow tax in the Blueprint, the result is to move the US closer to a consumption based tax system.

The concept of a destination based cash-flow tax (DBCFT) has been around for some time. Two papers by Alan Auerbach (1997, 2011) seem to have been influential in generating interest in this fundamental change in the way we are taxed in the U.S.[12] In addition, the President's Advisory Panel on Federal Tax Reform proposed a version of the tax (2005) as part of its recommendations.[13]

One controversial aspect of the BAT is that many economists believe that, once implemented – symmetrically, taxing imports and exempting exports – the tax should have no effect on international trade, business profits or prices. This is, they believe, because exchange rates should adjust immediately to the new tax causing the U.S. dollar to appreciate and offset any distortions it would otherwise cause. There is a surprising degree of consensus among economists on this point reflecting, perhaps, the theoretical elegance surrounding this result. Non-economists, especially business people, are generally skeptical of this claim. Moreover, there is also a similar amount of consensus amongst economists that looking backward, currency cross pairs in reality did not end up trading consistent with the a priori expectation.[14]

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[12] Auerbach, A. J., "The Future of Fundamental Tax Reform", *The American Economic Review*, 87, no. 2, (1997) and Auerbach, A. J., "A Modern Corporate Tax", *Center for American Progress* and *The Hamilton Project* (2010).
[13] President's Advisory Panel on Federal Tax Reform, Simple, Fair and Pro-Growth: Proposals to Fix America's Tax System (2005).
[14] For example, Kenneth Rogoff has written about the "exchange rate disconnect puzzle," explaining that random walk models do better job of predicting currency behavior than economic fundamentals.

A.   Description of the Proposal

The BAT would operate in two ways. Simply put, exports would be exempt from tax while imports would be taxed. Practically, this means that companies that import goods that are sold in the U.S. would not be allowed to deduct the cost of the imports when computing their taxes. Conversely, firms that export goods and services would not be taxed on their revenue.

A simple example, prepared by the Tax Foundation, is useful to examine how the BAT would operate. (We assume a 20 percent corporate income tax rate as is proposed in the Blueprint.) We consider three companies with different business structures. Business No. 1 performs all its operations (production, sales) in the U.S. and would not be affected by the BAT (domestic firm). Business No. 2 uses foreign inputs but sells their product in the U.S. (importer). Business No. 3 relies on domestic inputs but sells it product overseas (exporter). We assume that each business has the same cost and revenue structure under current law, as summarized in Table 3.

Table 3 – 20 Percent Income Tax, No Border Adjustment (Current Law)			
	Business 1: All Domestic	Business 2: Foreign Inputs, Sells Domestic	Business 3: Domestic Inputs, Foreign Sales
Revenue	$100	$100	$100
Cost of Goods Sold	$60	$60	$60
Taxable Income/Profits	$40	$40	$40
Tax	$8	$8	$8
After Tax Income	$32	$32	$32
Source: Tax Foundation (2016)			

As indicated in the figures, each business is identical with respect to revenue, costs, taxes and profits. This reflects the fact that, under current law, firms are taxed where production occurs. Since all production in this example occurs in the U.S., each company is treated the same under the tax law. Table 4 shows how these figures would change under the BAT.

Table 4 – 20 Percent Income Tax, Border Adjustment, No Currency Adjustment			
	Business 1: All Domestic	**Business 2: Foreign Inputs, Sells Domestic**	**Business 3: Domestic Inputs, Foreign Sales**
Revenue	$100	$100	$100
Cost of Goods Sold	$60	$60	$60
Taxable Income/Profits	$40	**$100**	**-$60**
Tax	$8	**$20**	**-$12**
After Tax Income	$32	**$20**	**$52**
Source: Tax Foundation (2016)			

In Table 4 we see how imposition of a BAT would alter the taxes paid and profits of each company. Business No. 2 would no longer be able to deduct the cost of its foreign inputs and would be taxed on the revenues it earns. Business No. 3, because it exports its entire product, is

not taxed on its inputs and actually receives a tax credit from the government.[15] Under this scenario, Business No. 1 is unaffected by the tax; Business No. 2 sees its taxes go up substantially; and Business No. 3 receives a tax cut. Profits (after-tax income) are similarly affected.

B.   Revenue Effect

Revenue estimates always contain estimates of changes in taxpayer behavior. What most revenue estimates do not account for, at least initially, is that a proposal might have a feedback effect on the macro economy. For example, a proposal to increase the gasoline tax would take into account that consumers would reduce their consumption of gasoline (by driving less or purchasing more fuel-efficient vehicles). But the estimate would not assume that GDP (e.g., wages, investment) would change. This is sometimes referred to – incorrectly in our view – as a "static" revenue estimate. When macroeconomic feedback effects are factored in, this is referred to as "dynamic scoring".

Beginning in the mid-1990s the JCT began developing the capability to provide dynamic scoring under certain circumstances. Presently, under House rules, the JCT is required, if asked, to provide a "dynamic score" when a tax provision is expected to result in a revenue effect of at least .25 percent of GDP (about $50 billion in 2017).[16] There are many reasons why a dynamic score is not prepared including:

- The proposal may be too small to have a measurable macroeconomic effect.
- There may not be sufficient consensus in the research community as to how the effects will be transmitted throughout the economy.
- There may not be available data to support the estimate.
- Time constraints may preclude the preparation of an estimate.

In this memorandum, our estimate of the BAT follows the JCT convention that GDP remains constant and, therefore, exchange rates do not adjust. Because the U.S. has persistently run a trade deficit over many years, it is expected that a BAT would raise revenue, at least in the short run. Table 5 shows the current account deficit over the past several years. It shows that over this period, the average deficit has been about $500 billion per year.[17]

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[15] The Blueprint does not specify how tax credits would be treated under the BAT.
[16] A point estimate of the dynamic score is required for the 10-year budget horizon. Under existing House rules, the JCT is required to prepare a qualitative estimate of the dynamic effect for the subsequent 20 years beyond the budget window. We elaborate on this in Appendix D.
[17] Because exports are not taxed under the BAT while imports are, we focus on the net trade deficit – the excess of imports over exports.

Table 5 – U.S. Goods and Services Current Account Trade Deficit (Billions of Dollars)						
	2010	**2011**	**2012**	**2013**	**2014**	**2015**
Exports of Goods and Services	1,853	2,127	2,219	2,293	2,377	2,261
Imports of Goods and Services	2,348	2,676	2,756	2,755	2,867	2,762
Deficit	**-495**	**-549**	**-537**	**-462**	**-491**	**-500**
Source: Bureau of Economic Analysis, International Transactions Account						

Many factors affect the trade deficit: interest rates, exchange rates, monetary policy and the actions of other countries. The uncertainty surrounding the deficit is evident in the year-to-fluctuations. In preparing our estimate, we make a simple assumption and assume that the trade deficit grows according to CBO's estimate of GDP.[18] We also assume that if a BAT were enacted, it would affect expenditures on or after January 1, 2018 and that the 20 percent corporate tax rate contained in the Blueprint is in effect. In estimating jargon, we assume the BAT is "stacked" after the corporate rate reduction. With these assumptions in place, Table 6 shows our estimate of the BAT, based on the conventional estimating methodology:

Table 6 – Estimated Revenue Effect of the Border Adjustment Tax, Fiscal Years 2018-2027 (Billions of Dollars)										
Fiscal Year	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**Total**
BAT	74.8	114.3	118.3	122.7	127.4	132.5	137.7	143.2	148.9	154.8	1,274.7
Source: Quantria Strategies										

We estimate that the BAT would raise about $1.3 trillion dollars over fiscal years 2018-2027, the current budget period. Again, this estimate assumes that there is no macroeconomic feedback effect. Implicit in this estimate is the assumption that the increased cost of the BAT on imports would be passed along to consumers in the form of higher prices. This assumption is standard in economics and reflects the fact that the border adjustments have similar characteristics to a VAT.[19] To put this estimate in perspective, Table 7 shows the CBO forecast of individual and corporate income tax collections over this period.

Table 7 – CBO Projections of Individual Income and Corporate Income Tax Revenue, 2018-2027 (Billions of Dollars)										
	2018	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**Total**
Individual	1,561.1	1,780.6	1,871.1	1,957.1	2,052.0	2,248.8	2,355.3	2,470.4	2,590.2	2,713.8	21,600.4
Corporate	320.4	339.7	351.9	382.0	377.4	385.5	395.8	407.8	422.2	439.2	3,821.9
Total	1,881.5	2,120.3	2,223.0	2,339.1	2,429.4	2,634.3	2,751.1	2,878.2	3,012.4	3,153.0	25,422.3
Source: CBO Budget Outlook, January 2017										

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[18] CBO Budget Outlook, January 2017.

[19] This is an example of "tax incidence", the theory of who actually pays the tax. Economic theory suggests that when a tax is equally borne by all businesses, it is passed forward to consumers.

Corporate tax collections over this period (fiscal years 2018-2027) are about $3.8 trillion so our estimate of the BAT would represent about one-third of this amount. It is useful to compare alternative estimates of the BAT. Table 8 compares our estimate with similar estimates prepared by the Tax Policy Center (TPC) and the Tax Foundation:

Table 8 – Comparison of Revenue Estimates of the Border Adjustment Tax		
Source	Estimate (*Billions of Dollars*)	Period (Fiscal Years)
Quantria Strategies	1,274.7	2018-2027
Tax Policy Center	1,179.6	2017-2026
Tax Foundation	1,069.0	2016-2025

The estimates are quite close with differences partly attributable to the different periods over which they were estimated. Adjusting for these small differences suggest that a BAT could increase revenues under the Blueprint by about $1.3 trillion over the next 10 years.

C.   Conclusions and Caveats

The BAT is one piece of a massive restructuring of the U.S. tax code that, when taken together with other components of the Republican Blueprint, will fundamentally change the way U.S. taxpayers interact with the tax law. We estimate that as part of this package, the BAT could raise an additional $1.3 trillion over the 10-year budget window.[20]

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[20] Some economists believe that, once a BAT is imposed, exchange rates should adjust to ensure that prices will remain unchanged, international trade will be unaffected and business profits will not be reduced. This is a controversial assumption and not shared by many non-economists. There are many factors that could prevent a full and immediate adjustment to exchange rates including: actions taken by the Fed should inflation increase as a result of the BAT and actions taken by central banks to counter the appreciation of the U.S. dollar, among others.

V. Analysis of Dynamic Effects

A typical revenue estimate is meant to capture the changes in government cash flows resulting from a tax law change. By convention, these estimates do not include any revenues that result from changes in the macro economy unless the changes are likely to reach a specified threshold of GDP. These additional economic effects are referred to as "dynamic" effects and the resulting estimate is sometimes referred to as a "dynamic score". (See Table 9 in the following section and Appendix D for a more detailed discussion of dynamic scoring and how Congressional economists implement it.)

It is important to point out that conventional revenue estimating methodology always includes estimates of taxpayer behavior. For example, if the tax rate on capital gains is reduced, we would expect that investors would realize additional capital gains and the initial revenue estimate would be offset by the additional tax collected on the sales. Occasionally, a conventional revenue estimate is referred to as a "static" estimate but this terminology can be misleading.

A. Overview

In this report, we calculate dynamic effects by relying on published reports by the JCT, Treasury and other organizations that specialize in tax policy analysis. We also rely on the Penn-Wharton Budget Model (PWBM), a publicly available macroeconomic model that is similar in many respects to one of the macro models relied on by the JCT.

As we explain above, in this analysis we take as our starting point the House GOP Blueprint. That is, we measure how the revenues collected under the Blueprint may change when certain tax law parameters are modified.

Our analysis also assumes that the Blueprint is revenue neutral with respect to present law, as the authors of the Blueprint have indicated.[21] Two recent estimates of the Blueprint, by the Tax Policy Center (TPC) and the Tax Foundation, have determined that the proposal falls short of revenue neutrality. For purposes of dynamic scoring, this could have important macroeconomic effects as the federal government would have to rely on additional borrowing to finance the shortfall and this will increase interest rates and slow economic growth.

A crucial distinction between the dynamic estimates that we calculate and those calculated by other researchers (e.g., the Tax Policy Center, Tax Foundation) is that they calculate their dynamic effects with respect to the entire package, including reductions in individual tax rates and deductions, preferential treatment of capital gains and dividends and international provisions. In both cases, the researchers found the Blueprint to lose revenue with respect to current law and this causes a drag on economic growth, as the government must borrow to

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[21] Our assumption that the Blueprint is revenue neutral is consistent with the views of its authors who indicated that any revenue shortfalls will be made up by raising additional revenues either by scaling back some of the provisions in the Blueprint or finding additional sources of revenue.

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finance the revenue shortfall. This borrowing will raise interest rates and crowd out private investment. Because we assume that the Blueprint is already revenue neutral, we ignore this effect. In addition, in the proposals we examine below, we enforce revenue neutrality.

In calculating dynamic effects, we examine how corporate tax rates and expensing are likely to affect the cost of capital. Lowering the cost of capital will increase investment which will increase productivity and, ultimately, economic growth. When calculating this feedback effect on investment, we start with estimates by the JCT of the dynamic effects of making Bonus Depreciation permanent.[22] Next, we adjust these effects by changes in the cost of capital under changes to expensing and the corporate tax rate. Third, we calibrate these effects by examining the dynamic feedback calculated by the Penn-Wharton Budget Model (PWBM).[23] The PWBM is an overlapping generation model (OLG) and is similar in many respects to one of the models used by JCT to calculate dynamic effects. (A more detailed discussion of dynamic scoring and how it is applied to tax legislation can be found in Appendix D.)

B.   Limitation on Interest Deductibility

The Blueprint contains a provision that cuts back on the deductibility of interest expense. Specifically, interest deductions are limited by the amount of interest received. The limitation only affects new investment after the date of enactment of the provision, which in our analysis we assume to be January 1, 2018.

We estimate that this provision will increase federal tax revenues by approximately $324 billion. In arriving at our estimate, we assume that taxpayers will alter the financing of new investments and shift away from debt. We assume that this limitation has a negligible effect on the macro economy.

C.   Incentive Effects of Rate Reductions versus Expensing

A central focus of this paper is the interaction of reducing the corporate rate and immediate expensing and implicit tradeoffs between these two provisions. Typically, policymakers (and economists) assume that immediate expensing provides a greater benefit to most businesses. However, we find that reducing the corporate rate is a more effective policy instrument and provides more economic stimulus.

In 2015, the JCT provided a dynamic score of a provision that would permanently extend 50 percent Bonus Depreciation. Their analysis suggested that the conventional static estimate would decrease by approximately 5 percent, if macroeconomic feedback effects were considered. In other words, 50 percent bonus depreciation (made permanent) would stimulate adequate taxable economic activity to offset only 5 percent of the revenue losses associated with bonus depreciation. This feedback effect is often believed to be an important driver of economic growth, but in reality its impact is limited.[24]

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[22] JCX-24-15, October 27, 2015.
[23] www.budgetmodel.wharton.upenn.edu/
[24] Many believe that expensing has a significant effect on economic growth, but these effects may be overstated.

However, it is important to understand that the JCT estimate assumes that the change is not revenue neutral. They find that it would result in increased Federal borrowing in the latter years of the budget period. This increased borrowing could, in turn, dampen any positive feedback effects of immediate expensing.

Reducing the corporate rate and immediate expensing will increase economic growth by reducing the cost of capital, either considered separately or together. But the marginal impacts of each are quite different.

Our analysis suggests that lowering the corporate rate gives a bigger "bang-for-the-buck" compared to expensing. In arriving at this conclusion, we rely on Quantria Strategies cost of capital model and examine how the cost of capital facing businesses changes under alternative scenarios involving expensing and the corporate rate. We are able to confirm the importance of the rate cut over immediate expensing by examining models that estimate the variations in the internal rate of return (IRR), a metric used frequently to make business investment decisions.

D.   Border Adjustment Tax Effects

For many reasons, the BAT is a controversial policy. By imposing a tax on imports, while shielding exports, it places imports at a competitive disadvantage, by design. Further, the BAT relies on theoretical economic assumptions that are untested in the U.S. There is little or no evidence to suggest that the theory of the BAT will be supported in practice. One reason that such uncertainty accompanies the BAT theory is its central, crucial assumption that exchange rates will immediately adjust and businesses will not experience any increase in costs. While many economists believe that, overtime, the exchange rates will accommodate the increases in BATs, there is little consensus regarding the speed and the magnitude of the adjustment in exchange rates. Therefore, the assumption that imposing a BAT will not increase business costs is clearly difficult to say with certainty. In the short run, it is likely to have disruptive effects on business costs. More than likely, if the adjustment proves to be slow or incomplete, businesses could face higher costs in the long run as well.

In addition, imposing a BAT could violate existing trade agreements or jeopardize future trade negotiations. Many believe that the BAT may violate existing trade agreements put forward by the World Trade Organization. Moreover, some commentators have voiced concerns that it may be unconstitutional.[25]

In our view, there is sufficient uncertainty about the macroeconomic effects of the BAT that we are unable, at this time, to ascribe any dynamic effect – positive or negative. This uncertainty relates to exchange rates, wages, price levels and effects on consumption savings and labor supply.

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[25] Refer to a recent opinion piece in the Washington Post, accessed online at:
https://www.washingtonpost.com/opinions/if-retail-politics-doesnt-kill-this-1-trillion-tax-the-supreme-court-should/2017/05/03/4a623b42-2f77-11e7-9dec-764dc781686f_story.html?utm_term=.c053c14cfd2a

VI.   Results

Table 9 shows the results of our analysis including dynamic, macroeconomic feedback effects. In each of the scenarios presented, we assume that the changes maintain revenue neutrality.

Table 9 – Integration of Simulation Results, Fiscal Years 2018-2027 *(Dollar Amounts in Billions)*		
Percent of Immediate Expensing	**Allow Corporate Tax Rate to Adjust Without Border Adjustment Tax**	**Maintain Corporate Rate at 20 Percent Without Border Adjustment Tax: Additional Spending Reductions Needed†**
MACRS	14.8%	-$602.3
50% Bonus	16.5%	-$370.3
50%	26.5%	$449.7
60%	30.5%	$614.7
70%	35.0%	$779.7
80%	¥	$1,122.7
90%	¥	$1,223.7
100%	¥	$1,274.7
Source: Quantria Strategies, May 15th, 2017		
† A negative number indicates the proposal raises revenue relative to the Blueprint.		
¥ Revenue target cannot be attained without a tax rate above 35 percent.		

 In the continuation of Table 9, we examine how these results may change if the limitation on interest deductibility were removed from the Blueprint.

Table 9 (continued) – Integration of Simulation Results, Fiscal Years 2018-2027 *(Dollar Amounts in Billions)*			
Depreciation	**Interest Deductibility**	**Allow Corporate Tax Rate to Adjust Without Border Adjustment Tax**	**Maintain Corporate Rate at 20 Percent Without Border Adjustment Tax: Additional Spending Reductions Needed †**
MACRS	Yes	17.2%	-$278.2
MACRS	No	14.8%	-$602.3
50% Bonus	Yes	19.5%	-$46.2
50% Bonus	No	16.5%	-$370.3
Full expensing	Yes	¥	$1,598.8
Full expensing	No	¥	$1,274.7
Source: Quantria Strategies, May 15th, 2017			
† A negative number indicates the proposal raises revenue relative to the Blueprint.			
¥ Revenue target cannot be attained without a tax rate above 35 percent.			

Appendix A – Recovery Periods

	Table A-1 – Recovery Period under MACRS and ADS	
MACRS Recovery Period	**General Rule-ADS Class Life[26]**	**Type of Property**
3 Years	4 years or less	3-year property
5 Years	More than 4 but less than 10 years	5-year property
7 Years	10 or more but less than 16 years and property without a class life (other than real property)	7-year property
10 Years	16 or more but less than 20 years	10-year property
15 Years	20 or more but less than 25 years	15-year property
20 Years	25 or more years	20-year property
25 Years	50 years	Water utility property
27.5 Years	40 years	Residential rental property
39 Years	40 years	Nonresidential real property
50 Years	50 years	Any railroad, grading or tunnel bore

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[26] General Rule-Class life refers to the class lives and recovery periods for the Alternative Depreciation System (ADS). ADS (Code section 168) is a depreciation system that the IRS requires to be used in special circumstances to calculate depreciation on certain depreciable assets. ADS generally increases the number of years over which property is depreciated (described in sections 168(c) and (e), thus decreasing the annual deduction..

Appendix B – Supporting Data

Table B-1 provides the estimated annual differences in depreciation deductions, by MACRS class life for the projected investment ($1,250 billion) in 2023. The calculations assume that the investment would continue at the projected levels, but the depreciation allowance for tax purposes would change from MACRS to ADS. In most cases, this involves an increase in the recovery period (extending the depreciation over a longer time period) and a decrease in recovery methods (in most cases from 200 percent declining balance to straight line methods, which reduces the allowable amount of depreciation in each year).

The investment relies on data from the Bureau of Economic Analysis investment flows for 2013. The projected values rely on the investment growth rates produced by the Congressional Budget Office. The initial classification into MACRS class lives is consistent with data from the Internal Revenue Service and the assigned values to Bureau of Economic Analysis data.

Table B-1 Estimated Annual Differences in Depreciation Deductions							
Tax Year	MACRS Class Life						
	3	5	7	10	15	20	27.5
2023	10,315	56,608	22,665	1,272	1,766	760	26
2024	20,630	135,860	59,498	3,611	6,540	3,077	41
2025	-2,290	58,873	34,246	2,482	5,170	2,565	41
2026	-8,025	12,680	16,234	1,579	3,955	2,093	41
2027	-13,753	7,359	3,348	856	2,853	1,655	41
2028	-6,877	-16,643	1,790	279	1,850	1,250	41
2029	0	-56,608	1,824	-36	1,271	876	41
2030	0	-56,608	-9,710	-36	1,271	529	41
2031	0	-56,608	-28,866	-33	1,285	430	41
2032	0	-56,608	-28,866	-36	1,271	430	41
2033	0	-28,304	-28,866	-783	1,285	430	41
2034	0	0	-28,866	-2,035	1,271	430	41
2035	0	0	-14,433	-2,035	1,285	431	41
2036	0	0	0	-2,035	1,271	430	41
2037	0	0	0	-2,035	1,285	431	41
2038	0	0	0	-1,017	-1,850	430	41
2039	0	0	0	0	-7,063	431	41
2040	0	0	0	0	-7,063	430	41
2041	0	0	0	0	-7,063	431	41
2042	0	0	0	0	-7,063	430	41
2043	0	0	0	0	-3,531	-1,134	41
2044	0	0	0	0	0	-3,742	41
2045	0	0	0	0	0	-3,742	41
2046	0	0	0	0	0	-3,742	41
2047	0	0	0	0	0	-3,742	41

Tax Year	MACRS Class Life						
	3	5	7	10	15	20	27.5
2048	0	0	0	0	0	-1,871	41
2049	0	0	0	0	0	0	41
2050	0	0	0	0	0	0	35
2051	0	0	0	0	0	0	-90
2052	0	0	0	0	0	0	-90
2053	0	0	0	0	0	0	-90
2054	0	0	0	0	0	0	-90
2055	0	0	0	0	0	0	-90
2056	0	0	0	0	0	0	-90
2057	0	0	0	0	0	0	-90
2058	0	0	0	0	0	0	-90
2059	0	0	0	0	0	0	-90
2060	0	0	0	0	0	0	-90
2061	0	0	0	0	0	0	-90
2062	0	0	0	0	0	0	-90
2063	0	0	0	0	0	0	-45
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table B-1 Estimated Annual Differences in Depreciation Deductions

Appendix C – Static Effect of House Republican Plan

In this Appendix we show how the revenue effect would change if dynamic macroeconomic feedback effects were excluded from the analysis. This is frequently referred to as the "static" effect. We point out, however, that the revenue estimates presented here contain significant behavioral adjustments. These adjustments relate primarily to taxpayers who switch to equity financing under the Blueprint because of the loss of the interest deduction and taxpayers.

Table C-1 – Integration of Simulation Results, Fiscal Years 2018-2027 *(Dollar Amounts in Billions)*		
Percent of Immediate Expensing	**Allow Corporate Tax Rate to Adjust Without Border Adjustment Tax**	**Maintain Corporate Rate at 20 Percent Without Border Adjustment Tax: Additional Spending Reductions Needed†**
MACRS	17.8%	-$231.9
50% Bonus	20%	$61.1
50%	34%	$1,013.4
60%	-	$1,208.8
70%	-	$1,636.0
80%	-	$1,809.1
90%	-	$2,026.0
100%	-	$2,089.1
Source: Quantria Strategies, May 15th, 2017		
† A negative number indicates the proposal raises revenue relative to the Blueprint.		
¥ Revenue target cannot be attained without a tax rate above 35 percent.		

 In the continuation of Table C-1, we examine how these results may change if the limitation on interest deductibility were removed from the Blueprint.

Table C-1 (Continued) – Integration of Dynamic Simulation Results, Fiscal Years 2018-2027 *(Dollar Amounts in Billions)*			
Depreciation	**Interest Deductibility**	**Allow Corporate Tax Rate to Adjust Without Border Adjustment Tax**	**Maintain Corporate Rate at 20 Percent Without Border Adjustment Tax: Additional Spending Reductions Needed †**
MACRS	Yes	21.0%	$92.1
MACRS	No	17.8%	-$231.9
50% Bonus	Yes	23.4%	$385.2
50% Bonus	No	20.0%	$61.1
Full expensing	Yes	-	$2,413.2
Full expensing	No	-	$2,089.1

Source: Quantria Strategies, May 15th, 2017
† A negative number indicates the proposal raises revenue relative to the Blueprint.
¥ Revenue target cannot be attained without a tax rate above 35 percent.

Appendix D – Overview of Dynamic Scoring

Conventional revenue estimates might change when the analysis incorporates dynamic (i.e., macroeconomic feedback) effects. Currently, the JCT relies on three very different macroeconomic models to assess the dynamic effects of proposals that are likely to result in significant changes to the macro economy. We review these models, indicate their strengths and weaknesses and describe how the JCT implements dynamic scoring.

We review recent JCT estimates of the effect of dynamic scoring on proposals to implement fundamental tax reform. We do this with an eye towards suggesting how estimates of immediate expensing might change under the models. In addition, we rely on the Penn-Wharton Budget Model (PWBM) to suggest how dynamic scoring might alter the revenue estimates of the Republican Tax Plan ("A Better Way").

A. Background and Context for Dynamic Analysis

When preparing revenue estimates for tax legislation, economists at JCT have traditionally relied on the assumption of "fixed GDP." Fixed GDP means that a tax provision cannot alter the overall magnitude of the economy, but it may alter the composition (i.e. provisions that increase economic activity in one sector will divert or move resources from another). This type of estimate is frequently referred to as a "static" estimate, a term that some consider pejorative.

Revenue estimates have always included estimates of behavioral changes that a taxpayer might undertake when facing a new tax. These behavioral changes include: changes in consumption (e.g., when an excise tax is imposed), changes in the timing of certain transactions (e.g., the decision of when to realize a capital gain or loss), and changes in tax planning (e.g., whether to choose a traditional IRA or a Roth IRA).
Each of these behavioral changes can have important effects on the magnitude of the revenue estimate and are incorporated in the "static" analysis. However, the static analysis does not incorporate changes in the macro economy that may result from the tax changes. Some of these changes may affect investment, labor supply or wages. These effects are frequently referred to as macroeconomic feedback effects and their implementation is known as "dynamic scoring."

Until recently, the principle tax models maintained and relied upon by JCT were "microsimulation models" that relied on detailed information from individual and corporate income tax returns. These models provide accurate estimates of important tax policy changes. For instance, if there is an increase in marginal rates, the model can predict accurately the changes in revenues, how those revenue effects are distributed across income classes, and who benefits most from these changes (e.g., "winners" and "losers"). These models, however, do not provide insights into how the tax changes affect economic performance in the aggregate.

Beginning in 1995, the Congress asked the JCT to develop a plan and framework for incorporating feedback effects into its estimating portfolio. Prior to this, there were several reasons to be skeptical of this approach. First, JCT believed that the economics profession was not in general agreement as to the correct approach to measure these effects and they were doubtful about their reliability. Second, very few revenue estimates would be likely to have a

measureable effect on the economy. Third, incorporating these effects would be time-consuming and divert resources from other estimating tasks. Fourth, by only including the dynamic effects of tax changes, the staff felt that an incomplete and possibly inaccurate picture of the effects would be produced if they were to omit spending provisions.

Post-1994, incorporating dynamic feedback effects at JCT can be seen as evolving in three stages:

- 1995 to 2003: Research the feasibility and reliability of incorporating results from alternative macroeconomic models into the estimation process.
- 2004 to 2014: Begin implementing House Rule XIII(3)(h)(2), passed in 2013, that required JCT to include macroeconomic analysis in certain situations and to provide a range of estimates of possible dynamic effects.
- 2015 to Present: Implement House Rule XIII(8)(b) that instructed JCT to provide a point estimate for each year of the 10-year budget horizon for any provision that is estimated to have a budget effect greater than 0.25 percent of GDP (about $50 Billion in 2017). In addition, JCT was required to give a qualitative impact assessment for the 20-year period beyond the budget horizon.

Until recently, macroeconomic models were limited in their ability to capture the details of complex tax legislation (e.g., marginal tax rates across different income sources). Most early models summarized the tax system with one or two average tax rates. As these models became more complex, the researchers incorporated additional detail to make the models more useful for tax policy. The macro models rely extensively on inputs from the micro models that have been the foundation of tax analysis at JCT for over 40 years.[27]

In 1997, JCT sponsored a symposium on macroeconomic modeling where nine modelers presented results for two basic tax reform options: (i) unified income tax (corporate integration) and (ii) movement to a VAT.[28] The lessons learned from this experiment remain valid today:

- Modeling framework matters;
- Parameter magnitudes matter;
- Monetary policy matters in some models;
- Characterization of present law matters; and
- Details of the proposal matter (e.g., transition relief).

Presently, the JCT relies on three macroeconomic models to provide dynamic revenue analysis and average the results of each model, after some adjustment described below, to arrive at the final result. Each model has its own strengths and weaknesses. The three macro models include

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[27] Microsimulation models are "bottom-up" models that rely on samples of individual and corporate income tax returns to calculate the effects of tax policy on revenues. Macro models are "top-down" models that analyze the relationships among economic aggregates (e.g., wages, interest rates, unemployment, GDP) to arrive at the same result.

[28] *Joint Committee on Taxation Tax Modeling Project and 1997 Tax Symposium Papers*, JCS-21-97, November 20, 1997.

a structural macroeconomic equilibrium growth model (MEG), an overlapping generations model (OLG), and a dynamic stochastic general equilibrium model (DSGE).

Basically, the MEG model is a "classic" macroeconomic model that relies on econometric estimates of structural (i.e., causal) relationships among macroeconomic aggregates. The MEG model is especially good at predicting short-run (e.g., 5-year) effects but is reasonably reliable in longer time frames. Businesses and households in the MEG model are "myopic" and future changes in fiscal policy have no effect on their decision-making.

The OLG model tracks cohorts of demographic groups over many years, simulating household and business decisions with respect to consumption, saving, investment and labor supply. The OLG model relies on microeconomic theory to derive changes in the behavior of the agents in the model. The DSGE model is similar to the OLG model but adds uncertainty of outcomes to the decision-making apparatus. Details on each of the models are shown in Table 11.

Table D-1 – Description of JCT's Macroeconomic Models	
Model	**Description**
Macro Equilibrium Growth Model (MEG)	▪ "Structural", i.e., ("causal") macroeconomic model ▪ Demand equals supply in the long run through price adjustment; not necessarily in the short run ▪ Does not assume that economy is at full employment ▪ Household consumption modeled according to life-cycle characteristics of households ▪ Labor supply modeled separately for 4 different population groups (e.g., high income, primary earner) ▪ Household consumption and savings decisions respond to after-tax returns ▪ Business investment responds to the user cost of capital ▪ "Open economy model"; cross border investment flows affect the domestic economy ▪ Individuals are myopic, i.e., do not anticipate changes in the economy or government policy
Overlapping Generations Model (OLG)	▪ Prices adjust to ensure supply equals demand each year ▪ 55 age-cohorts are modeled separately ▪ Key decision variables and drivers relate to labor supply (after-tax wage rate), savings and consumption (after-tax return), business investment (user cost of capital) ▪ Unlike the MEG, the OLG model is a perfect foresight model and future, anticipated changes in fiscal policy can affect outcomes
Dynamic Stochastic General Equilibrium Model (DSGE)	▪ Similar to the MEG model in that demand may not always equal supply

Table D-1 – Description of JCT's Macroeconomic Models	
Model	**Description**
	▪ Unlike the MEG and OGM, the DSGE factors in uncertainty with respect to behavior and outcomes ▪ Government debt cannot grow faster than GDP ▪ Savers and non-savers modeled separately ▪ Key parameters similar to MEG and OLG models ▪ "Closed" economy; no international sector
The Joint Committee on Taxation Revenue Estimating Process, January 2017 https://www.jct.gov/publications.html	

B.   Current Estimating Practices

Estimating the macroeconomic effects of a tax policy change begins with the primary conventional models in use at JCT: an individual model (IM), a business model (BM) and a depreciation model (DM). The individual and business models are micro models, relying on samples of individual and corporate tax returns while the depreciation model begins with detailed investment data prepared by the Bureau of Economic Analysis (BEA).

The first step is to calculate results from the micro models. The macro and micro teams discuss what additional detail is necessary and how to incorporate this information into the macro models. This may require further modifications to either or both models to support the analysis.

Next, the micro team calculates average and marginal tax rates (ATRs, MTRs) for different sources of income under the baseline scenario (current law) and the tax proposal under consideration (proposed law). Many proposals require supplemental data (i.e. data not contained in the IM or BM). In these cases, "off-model" adjustments are made to the ATRs and MTRs.

Once the tax rates are calculated, preliminary estimates are obtained from each of the macro models for current law and proposed law. In this initial step, macroeconomic aggregates (e.g., GDP) are held constant in order to replicate a conventional revenue estimate. These preliminary estimates are then compared with the estimates from the micro models to see if they are in rough agreement. If they are not in agreement, an iterative adjustment process continues until the macro models match.

Once the JCT staff is satisfied that the macro models are producing the same results as the conventional micro models, then they relax the fixed GDP assumption and rerun the macro models. The economists examine the macro responses across numerous dimensions for consistency, asking:

- ▪ Is the percentage change in revenues consistent with the percentage change in GDP?
- ▪ Do the changes in macro aggregates (consumption, labor supply, investment) make sense given the policy?
- ▪ Are additional changes necessary in our modeling approach?

When results are not easily explained, they perform sensitivity analyses and the models are run iteratively, with each provision added incrementally. This allows the JCT to evaluate the incremental changes produced by each provision. The results are then compared across each of the three macro models to identify any discrepancies and make the necessary modifications.

The final step is to prepare a written report to describe how the proposal will affect the macro economy, ATRs and MTRs, labor supply, consumption, investment and, of course, on Federal revenues. This serves as a further check on the reasonableness of the models' results.

1. Dynamic Scoring in Practice

In past years, the JCT provided dynamic scores on several tax proposals, including the Affordable Care Act (ACA) in 2010, Bonus Depreciation in 2014, Research and Development in 2014, and Small Business Tax Cuts in 2012. Perhaps the most relevant analysis for fundamental tax reform is the JCT's analysis of Chairman Camp's Tax Reform Act of 2014.[29]

Camp Plan – While fundamentally different in many respects to the House Republican Blueprint, the Camp Plan contained many similarities and objectives: (i) maintain revenue neutrality; (ii) lower tax rates on individuals and businesses; (iii) eliminate or curtail special tax provision; and (iv) simplify the tax code. Major provisions of the plan include:

- Replacing the current law individual rate schedule with two rates, 10 and 25 percent;
- A 10 percent surtax for individuals on certain sources of income;
- Elimination of certain itemized deductions;
- Increase in the standard deduction and repeal in the personal exemption;
- Top corporate tax rate of 25 percent;
- Eliminating modified accelerated cost recovery (MACRS) and replacing it with the Alternative Depreciation System (ADS);
- Require amortization of R&D expenditures instead of expensing; and
- Move towards a territorial based tax system for multinational corporations.

JCT's conventional estimate of the Camp Plan indicated it would result in an increase in Federal revenues of about $3.0 billion of a ten-year period (fiscal years 2014 to 2023) – essentially revenue neutral given the size of the U.S. economy.

In preparing their dynamic score, JCT relied on their MEG and OLG models.[30] They produced a range of estimates of the likely macroeconomic feedback effect as a percentage of real GDP over the budget horizon. The estimates all indicated that the plan would increase real GDP from a low of 0.1 to 1.6 percent. This overall increase in economic growth is due primarily to the lower marginal tax rates faced by individuals and corporations. This is expected to increase labor supply, generally, although the repeal of MACRS would have the opposite effect on investment.

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[29] *Macroeconomic Analysis of the "Tax Reform Act of 2014"*, Joint Committee on Taxation, JCX-22-14, February 26, 2014.

[30] It is likely that they did not rely on the DSGE model because it does not include a foreign sector (see Table 1).

The range of estimates reflect differing assumptions as to labor supply responsiveness, actions taken by the Federal Reserve Board with respect to monetary policy and shifting of intellectual property (IP) for multinational corporations (OLG model only). A midpoint estimate of the dynamic effect translates into about $50 billion per year.

A very different feedback effect is calculated when business investment is looked at in isolation. Here, the dynamic effect is generally negative with respect to real GDP across all models. While the estimates predict a slightly positive feedback effect in the first five years of the plan, this turns negative in the final five years resulting in an overall change in real GDP ranging from a slightly positive effect of 0.1 to -0.6 percent with an average across all models of about -0.3 percent or a reduction in tax revenues of about $11 billion per year.

In summary, the JCT concluded:

> "Broadening of the individual and corporate income tax bases through elimination of many preferences in the form of deductions, exemptions, and tax credits allows for a reduction in average and effective marginal tax rates for most individual taxpayers, which provides both an incentive for increased labor effort, and an increase in demand for goods and services. *These changes also reduce the after-tax return to investment under many modeling assumptions, providing an incentive for a reduction in the U.S. domestic capital stock.* On net, these changes are expected to result in an increase in economic output relative to present law." *(Emphasis added)*

Bonus Depreciation – In 2015, the JCT provided a dynamic score on H.R. 2510, a bill that would modify and make permanent bonus depreciation. To the best of our knowledge, this was the first dynamic score that the JCT provided under the revised House budget rule that required a point estimate for each year in the 10-year budget window.

In arriving at their estimate, the JCT relied in their MEG model. They estimated that the conventional static estimate would reduce Federal revenues by about $280 billion over the 2016 to 2025 fiscal years. After including macroeconomic feedbacks effects, this revenue loss is reduced by $30.7 billion, or about 11 percent. However, the increase in the deficit is expected to result in additional debt service payments (outlays) of about $17.0 billion, resulting in a net feedback effect of $13.7 billion or about 4.8 percent.

Because the new House rule requires JCT to prove a qualitative estimate of the dynamic effect for the 20 years after the budget period, it is instructive to see how they comply with this provision. The JCT concluded:

> "In the second and third decades after enactment, because the bill is expected to result in continuing increases in Federal debt, it is expected to make private borrowing more expensive, reducing investment incentives, and thus reducing the rate of increase in capital stock, GDP, and associated revenues relative to those effects within the budget period. The extent to which this crowding out of private investment incentives could

eventually lead to the macroeconomic effects of the proposal reducing revenues relative to the conventional estimate is too uncertain to enable a prediction on the sign of the macroeconomic revenue feedback effects in the second or third decades after enactment and beyond."

Penn-Wharton Budget Model (PWBM) – A recent addition to the macro-modeling suite is the Penn-Wharton Budget Model developed at the University of Pennsylvania and the Wharton School of Business. The model is open-source and freely available to the public to conduct "what-if" policy simulations of changes to tax and spending programs.

The model is overlapping generation model, similar to JCT's. The model relies on extensive calibration of economic and demographic totals from a variety of sources including: IRS Statistics of Income, Census Current Population Survey, Federal Reserve Board Survey of Consumer Finances, Bureau of Economic Analysis National Income and Product Accounts, and Social Security Administration data on benefits and earnings.

While it is still early to assess the reliability of the model, to our knowledge it is the first to evaluate the House Republican Blueprint in significant detail. The model indicates that macroeconomic feedback would results in increased revenues of $593.3 billion for the 2016 to 2026 fiscal years or about 1.5 percent of total individual and corporate revenues over the period.[31]

C.   Conclusions

- Dynamic scoring of tax bills has become part of the legislative landscape.
- JCT is required, if requested, to prepare a 10-year estimate of any tax proposal that is expected to have a budget effect greater than .25 percent of GDP.
- In addition, recent House rules require that JCT provide a qualitative estimate of the macroeconomic effects for the 20-year period after the budget horizon.
- Compared to the microsimulation models used in revenue estimating for over 40 years, macro models are "blunt instruments" and require significant input from the micro models.
- Significant advancements in macro modeling in the last decade has convinced the JCT staff that they can provide reliable estimates of the effect of tax policy on the macro economy.
- Evidence to date suggests that, depending on the policy being considered, macro feedback effects are likely to be modest especially when comprehensive tax reform is being considered and revenue neutrality is maintained.
- When revenue neutrality is not an objective, significant impediments to economic growth are the increased interest payments when the proposal under consideration increases the federal debt.
- These increased interest payments will have important consequences if the House Republican Blueprint is ultimately found to lose revenue over the 10-year budget window.

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[31] Despite this positive macroeconomic feedback, the model also predicts that, including these dynamic effects, the Blueprint falls short of revenue neutrality by about $2.5 trillion over 10-years.

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